

Ascend

# MultiDSL



Richard Sekar

15-14-PR





# MultiDSL

## Table of Contents

- **Introduction**
- **Market Overview**
- **Technology Overview**
- **Market Challenges**
- **Product Overview**
- **Applications**
- **Summary**



# MultiDSL

## Introduction

- **DSL — Digital Subscriber Line**
- **Several DSL technologies**
  - IDSL (ISDN DSL)
  - HDSL (High Bit Rate DSL)
  - SDSL (Single Pair HDSL)
  - RADSL-CAP (Rate Adaptive ADSL-CAP)
  - RADSL-DMT (Rate Adaptive ADSL-DMT)
  - VDSL (Very High Bit Rate DSL)



# MultiDSL Market Overview

## xDSL Market Segmentation

- **WAN Copper**
  - RBOCs/Carriers own the local loop
  - Independent Telephone Companies own the local loop
- **DRY Copper**
  - CLEC/CAP/ISP leasing copper pair from telephone companies
- **Free Copper**
  - Copper wires within a building/campus
  - Typically owned by property management/building owners
  - ISPs can quickly offer xDSL service



# MultiDSL Market Overview

- **Market Forces Driving DSL**
  - High-speed Internet applications
  - Increased opportunity due to Telecommunications Act of 1996
  - Competitive pressure from Cable companies
  - Need to alleviate voice network congestion
  - Ability to leverage existing “local loop” twisted pair of wire
- **Target Customers for MultiDSL**
  - RBOCs
  - CLECs/CAPs
  - Independent Telephone Companies
  - Frame Relay Service Providers
  - Internet Service Providers
  - Corporations and Universities



# MultiDSL Market Overview

Application	28.8 Kbps	128 Kbps	768 Kbps	1.5 Mbps	3 - 6 Mbps
Internet - Consumer Access					
Internet - Small Office/Home Office					
Internet - Business Web Server Hosting					
Intranet - Mobile Worker					
Intranet - TeleWorker					
Intranet - Programmers					
MultiMedia - Graphics Designers					
MultiMedia - Interactive Web Sites					
MultiMedia - Video on Demand					



# MultiDSL Market Overview

## The case for IDSL per Dataquest

	1997	1998	1999	2000	2001
xDSL*	31,500	67,400	125,60	247,050	448,050
IDSL	43,60	212,000	444,100	734,100	1,103,500
Total	75,100	279,400	569,700	981,200	1,551,600

\* Includes only ADSL, VDSL and SDSL.

Source: Dataquest (published in Communications Week, July 7, 1997, Page 27)

### Reasons for IDSL:

Uses same ISDN CPE, avoids the “standards holy war”



# MultiDSL Market Overview

## CAP/CLEC : Buildings on Net

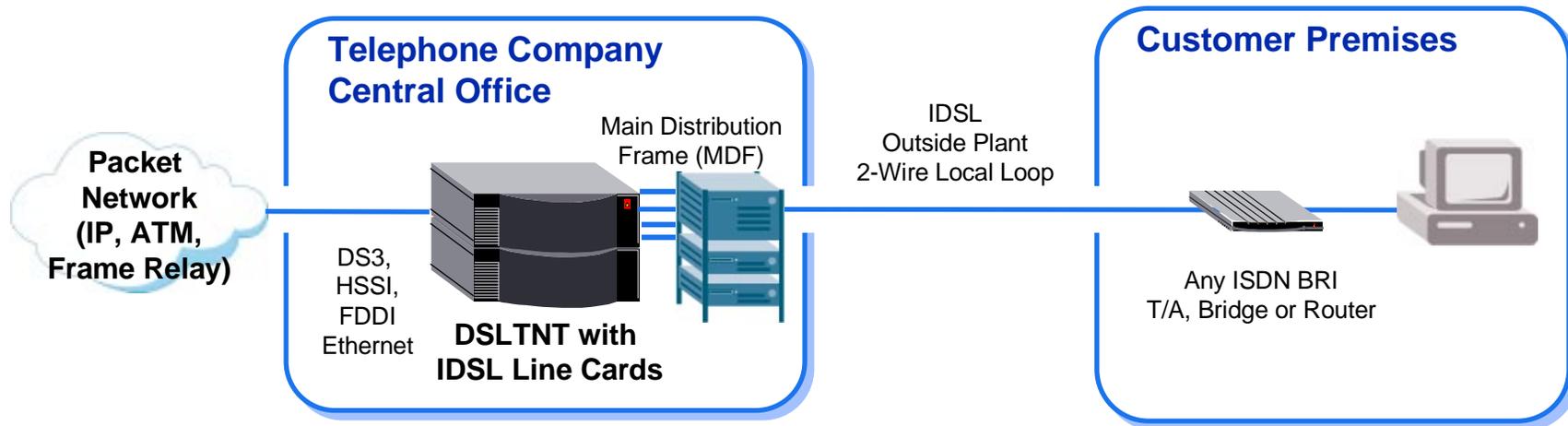
- **Total number of buildings on net: 23,875**
- **Top CAP/CLECs with access to buildings**
  - MFS: 11,031
  - MCIMetro: 3,200
  - TCG: 2,781
  - Hyperion Telecom: 1,101
  - GST Telecom: 739
  - Brooks Fiber: 734
  - American Communications: 532
  - ICG Communications: 478
  - McLeod: 442
  - Intermedia Communications: 429
  - NEXTLINK Communications: 420

*Source: New Paradigm Resources Group, Inc.*



# Technology Overview

## ISDN Digital Subscriber Line (IDSL)

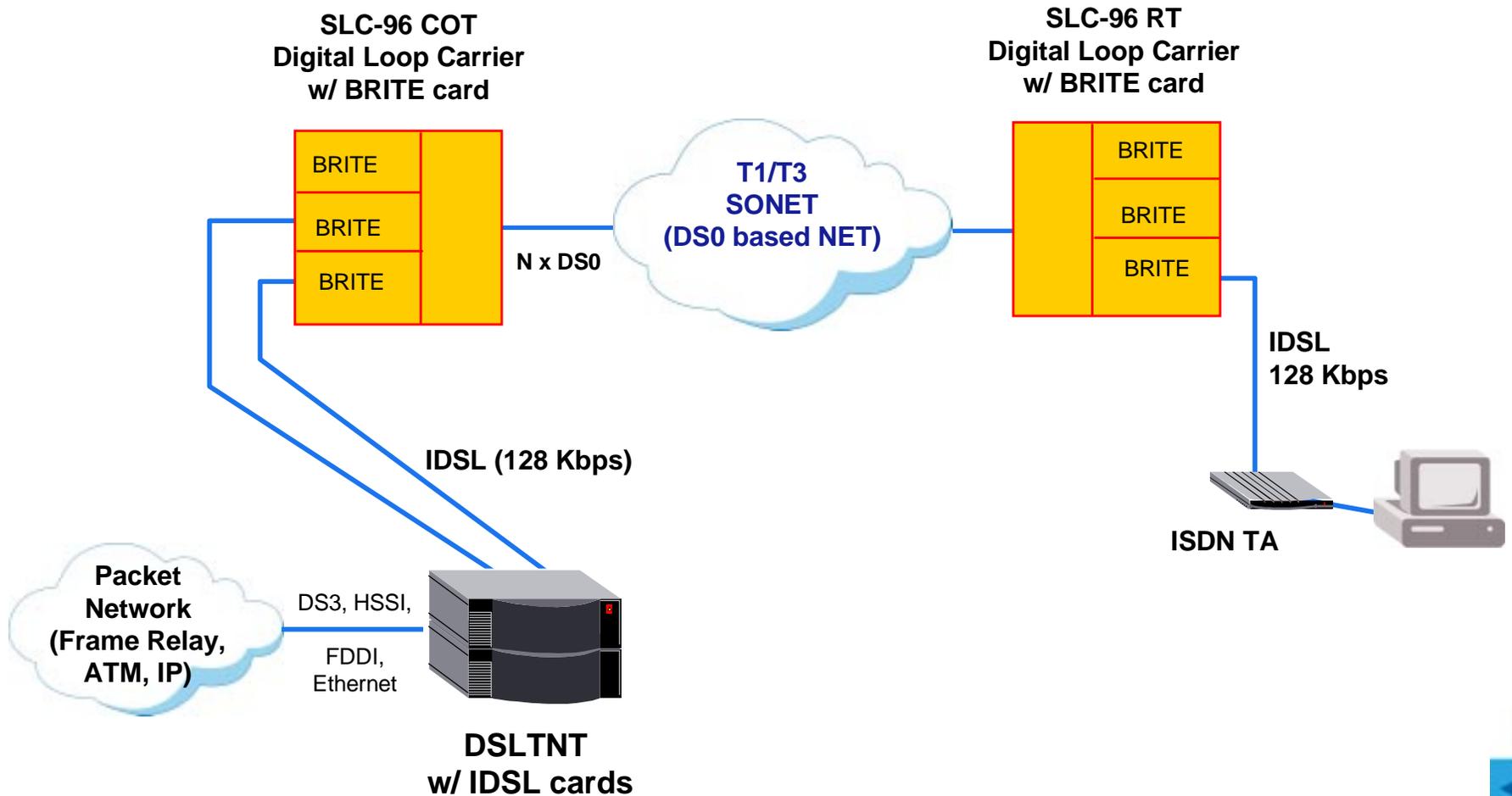


- **IDSL – Technological innovation from Ascend**
- **128 Kbps symmetric data rate**
- **Single pair local loop to 18,000 ft.**
- **Line monitoring and diagnostics**
- **Compatible with any ISDN BRI TA, bridge or router**
- **2B1Q line code for transparent operation through “U” loop repeaters and Digital Loop Carrier Systems (DLCs)**



# Technology Overview

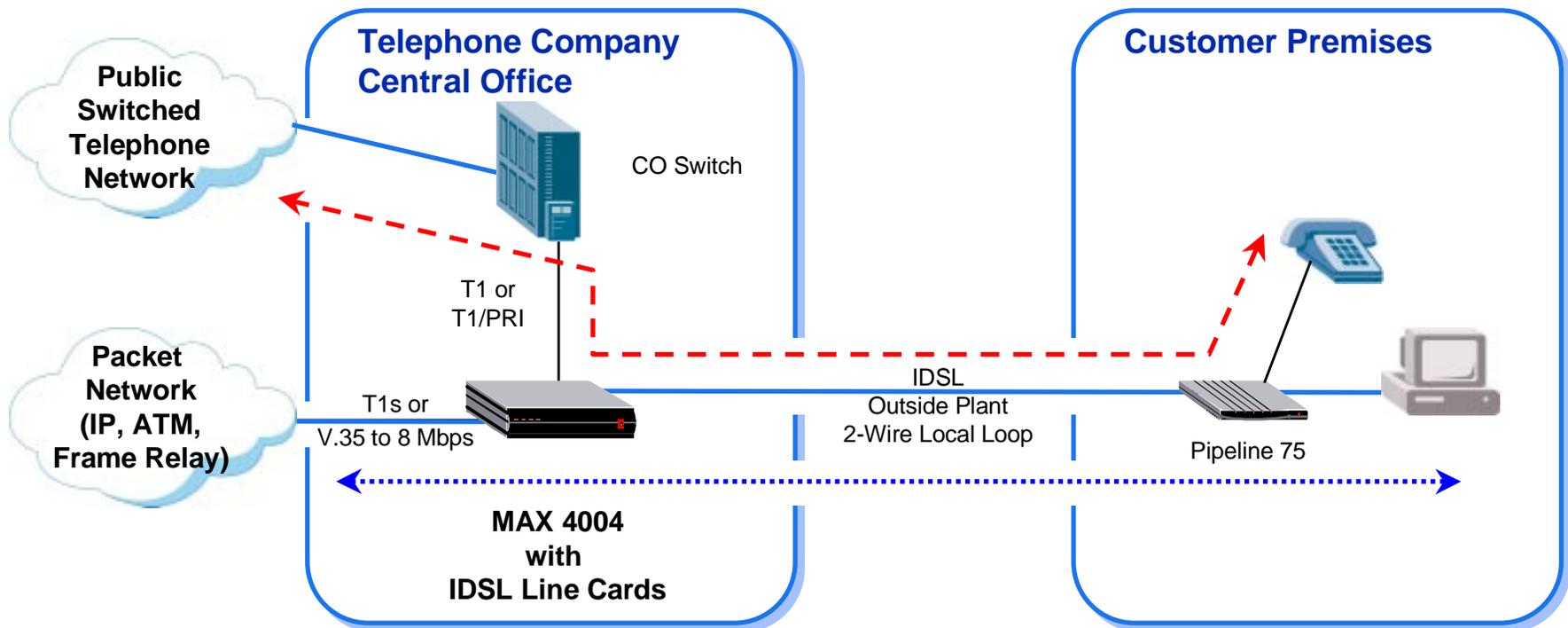
## IDSL Transparent to SLC/DLC





# Technology Overview

## ISDN Digital Subscriber Line (IDSL) Voice & Data





# Technology Overview

## Why IDSL?

- **Very large percentage (approx. 30-40%) of local loops have DLCs/U Loop Repeaters**
  - Only IDSL will work
  - SDSL, HDSL, ADSL will not work
- **Protects investment on current ISDN CPE**
  - IDSL works with any ISDN TA from any vendor
  - SDSL, HDSL, ADSL require investment in new CPE
- **Ideal for longer distances than 18,000 feet**
  - With DLCs, IDSL can go tens of miles
  - SDSL/HDSL (up to 12,000 ft), ADSL (18,000 ft at lower speeds)
- **Can co-exist with T1 on the same binder group**



# Technology Overview

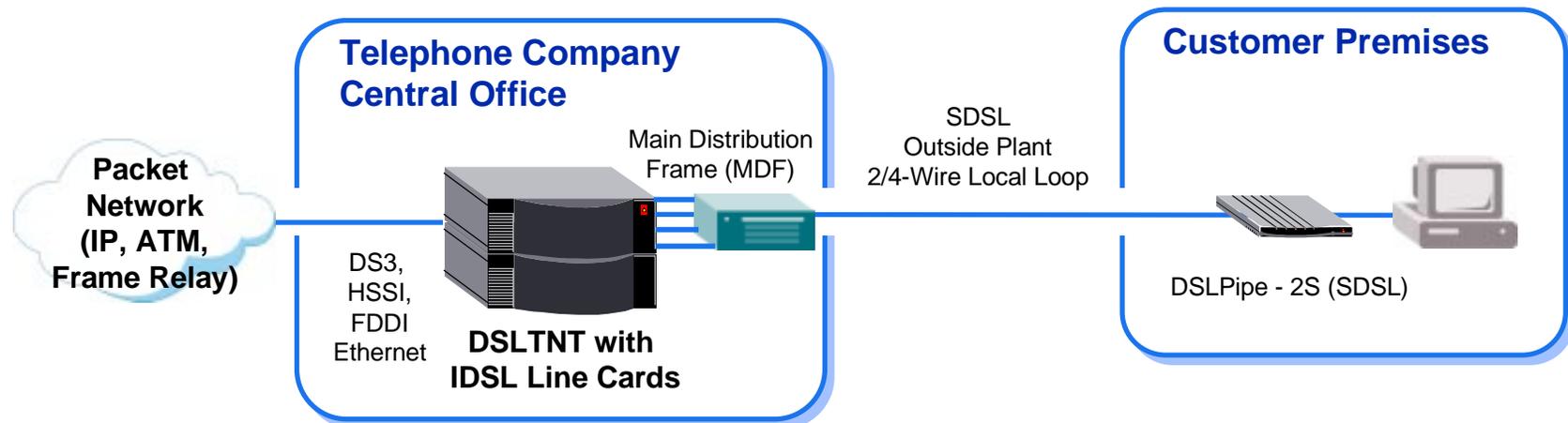
## ISDN Vs IDSL

- **ISDN**
  - Uses CO switch for data calls
  - Port contention and delays
  - 2 B-channels not always available
  - Can be expensive for small businesses (e.g. with 0.02/minute/B-channel usage charge, monthly charge can be as high as \$1800)
  - Contributes to voice network congestion
- **IDSL**
  - Does not use CO switch for data calls
  - No port contention and delays
  - Always-on 128 Kbps connection
  - Can be flat rate (\$75-\$150 per month); no usage charge; ideal for small businesses hosting Web servers
  - Alleviates voice network congestion



# Technology Overview

## Symmetric Digital Subscriber Line (SDSL)



- 1.54 Mbps, two pairs of wires, up to 12,000 ft
- 768 Kbps, one pair of wires, up to 12,000 ft
- Line monitoring and diagnostics
- CPE provides Ethernet interface
- 2B1Q line coding



# Technology Overview

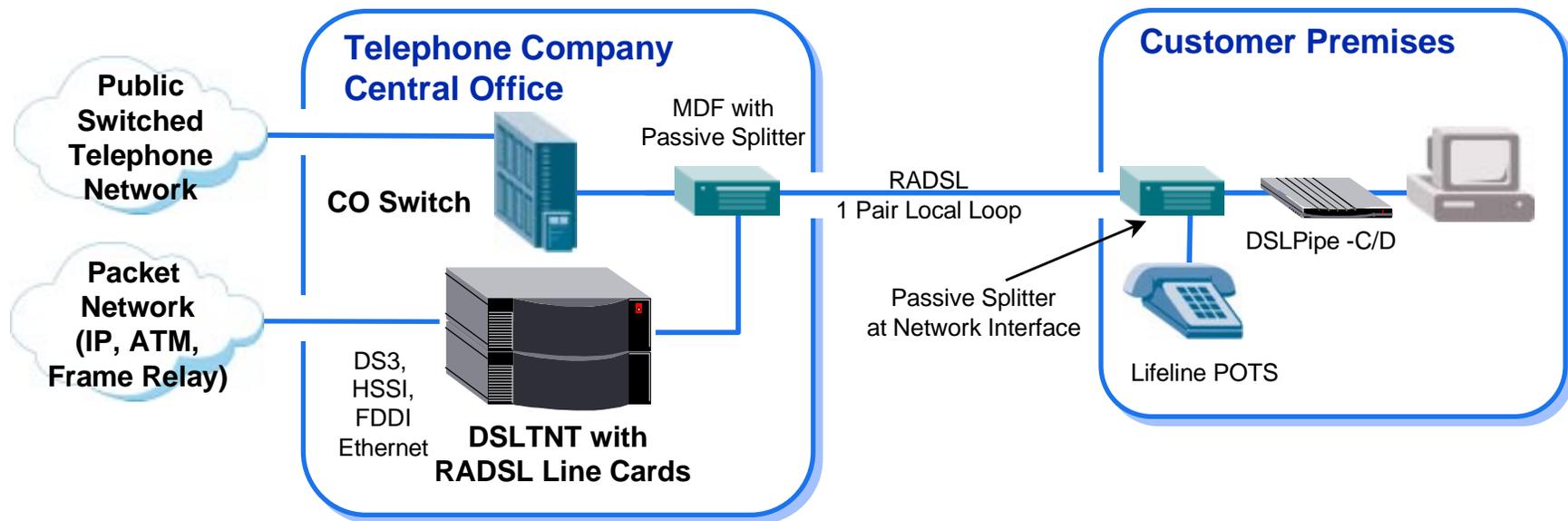
## Why SDSL ?

- **Can Co-Exist with T1 on the same binder group**
  - SDSL works well with T1 in the same binder group
  - Higher reliability
- **Need for higher speed in both directions**
  - 768 Kbps/1.54 Mbps in both directions with SDSL
  - ADSL can go down to as slow as 272 Kbps upstream and 640 Kbps downstream



# Technology Overview

## Asymmetric DSL (RADSL)



- **CAP - Single Pair, 17,000 ft. Loop**
  - 544 Kbps Upstream
  - 640 Kbps Downstream
- **CAP - Single Pair, 10,000/12,000 ft. Loop**
  - 1.0/1.0 Mbps Upstream
  - 7.0/2.5 Mbps Downstream
- **Lifeline POTS**
- **DMT - Single Pair, 18,000 ft. Loop**
  - 176 Kbps Upstream
  - 1.54 Mbps Downstream
- **DMT - Single Pair, 12,000 ft. Loop**
  - 640 Kbps Upstream
  - 6.14 Mbps Downstream
- **Lifeline POTS**



# Market Challenges

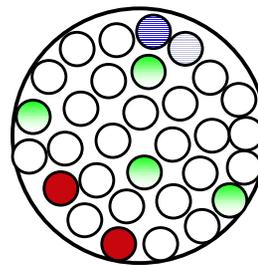
## xDSL in the Same Binder

	IDSL	SDSL	T1	ADSL
IDSL	Yes	Yes	Yes	Yes
SDSL	Yes	Yes	Yes	Yes
T1	Yes	Yes	Yes	No
ADSL	Yes	Yes	No	Yes

 - T1

 - IDSL/ SDSL/ HDSL/ ISDN

 - ADSL

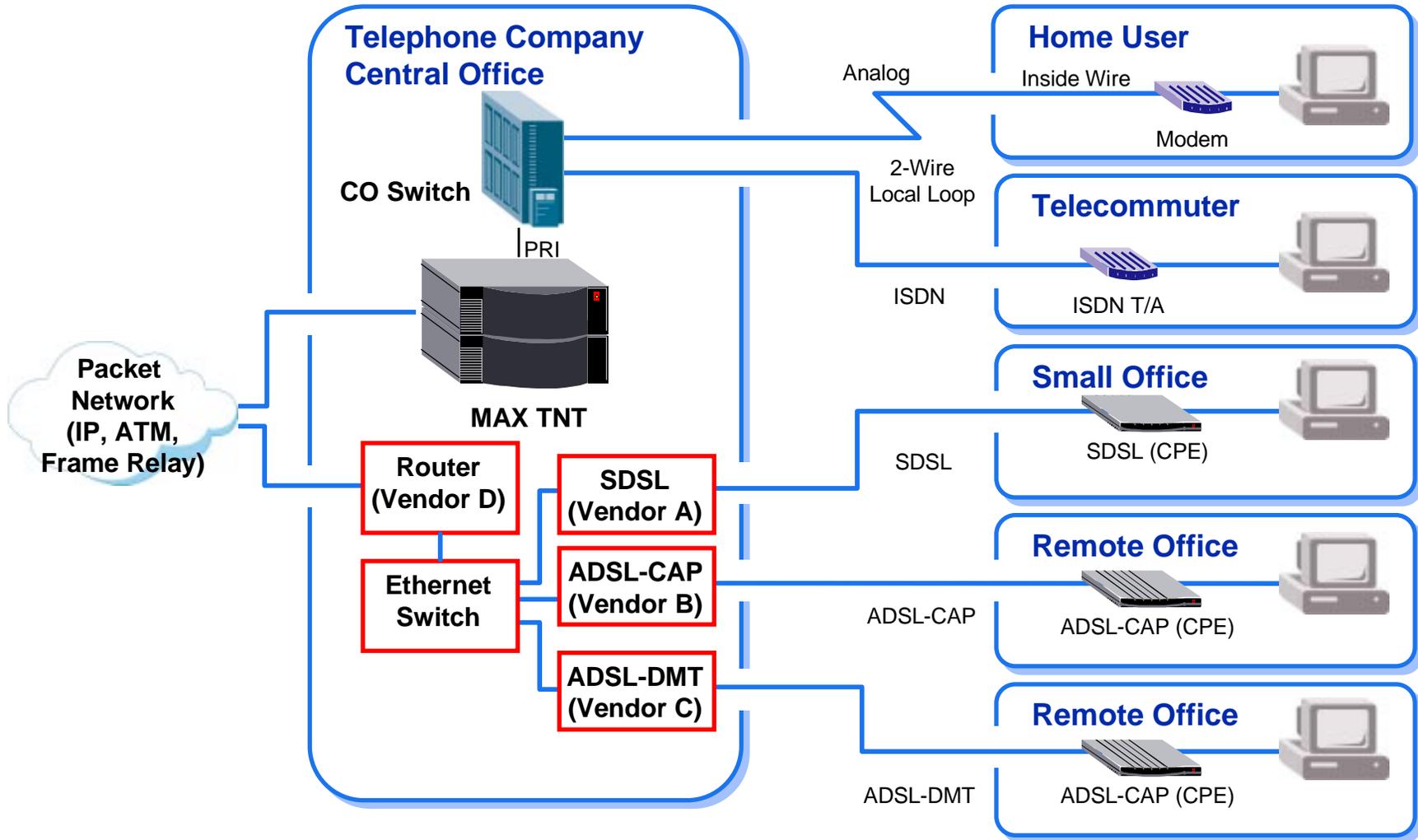


**Binder Group**



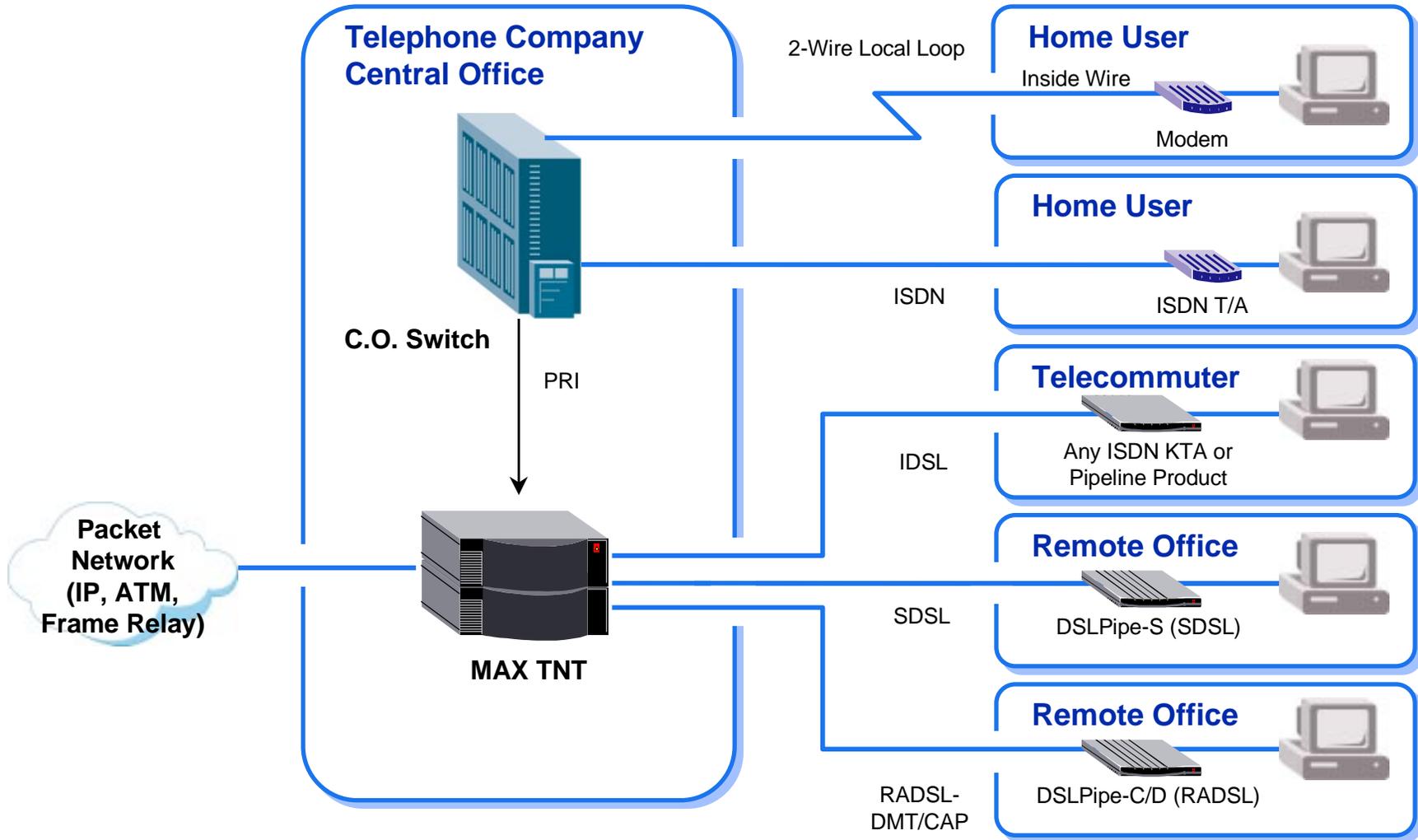
# Market Challenges

## Without Ascend DSL solution





# Market Challenges With Ascend DSL solution





# Product Overview

- **Central Office Equipment (COE)**

- DSLTNT™, MAX TNT™
  - RADSL-CAP
  - RADSL-DMT
  - SDSL
  - IDSL
- MAX™ 4000/4002/4004
  - IDSL

- **Customer Premises Equipment (CPE)**

- DSLPipe™ -C (RADSL-CAP)
- DSLPipe-D (RADSL-DMT)
- DSLPipe-S (SDSL)
- DSLPipe-2S (SDSL)
- Pipeline® (IDSL)
- Any ISDN TA (IDSL)



# Product Overview

<b>MultiDSL Cards</b>	<b>Ports per Card</b>	<b>Max # of Ports /Chassis</b>	<b>Availability</b>
<b>IDSL (MAX 400x)</b>	<b>8</b>	<b>40</b>	<b>Shipping</b>
<b>IDSL (DSL TNT &amp; MAX TNT)</b>	<b>32</b>	<b>224</b>	<b>Shipping</b>
<b>SDSL (DSL TNT &amp; MAX TNT)</b>	<b>16</b>	<b>240</b>	<b>Shipping</b>
<b>RADSL-CAP (DSL TNT &amp; MAX TNT)</b>	<b>6</b>	<b>90</b>	<b>Shipping</b>
<b>RADSL-CAP (standalone)</b>	<b>1 port</b>	<b>1 per unit</b>	<b>Shipping</b>
<b>SDSL (standalone)</b>	<b>1 port</b>	<b>1 per unit</b>	<b>Shipping</b>
<b>RADSL-DMT (DSL TNT &amp; MAX TNT)</b>	<b>TBD</b>	<b>TBD</b>	<b>Q4 1997</b>



# Product Overview

	<b>MultiDSL</b>	<b>Availability</b>
<b>Pipeline</b>	<b>IDSL</b>	<b>Shipping</b>
<b>DSLPipe-2S</b>	<b>SDSL</b>	<b>Shipping</b>
<b>DSLPipe-S</b>	<b>SDSL</b>	<b>Shipping</b>
<b>DSLPipe-C</b>	<b>RADSL-CAP</b>	<b>Shipping</b>
<b>DSLPipe-D</b>	<b>RADSL-DMT</b>	<b>Q4. 1997</b>



# Product Overview

## Central Office Equipment

- **DSL TNT**
  - Fully integrated, multiservice, xDSL concentrator
  - 16-slots per 14" chassis
  - Redundant AC/DC power supply,
  - Hot-swappable line cards
  - Line Cards: RADSL-CAP, RADSL-DMT, SDSL, IDSL
  - Network Interface Cards: T1/PRI, E1/PRI, FrameLine™, 10Base-T, 100Base-T, HSSI, DS-3, SWAN
  - Line cards & network interface cards are interchangeable between DSL TNT and MAX TNT —protects customer investment
  - Fits seamlessly into existing authentication and accounting infrastructure
  - Transport protocols: Frame Relay concentration, PPP, MP, MP+



# Product Overview

## Central Office Equipment

- **DSL TNT (Continued)**
  - List Price:
    - \$8,900
      - Base chassis, one power supply (AC/DC), one controller card, support for RADSL line cards, network interface cards and Frame Relay
    - \$4,000
      - SDSL hash code; Adds support for SDSL line card and ISDN signaling
    - \$4,000
      - IDSL hash code; Adds support for IDSL line card and ISDN signaling
  - Price for network interface cards for DSL TNT are same as for MAX TNT



# Product Overview

## Central Office Equipment

- **RADSL-CAP**
  - DSLTNT, MAX TNT
  - 6-port per line card
  - Up to 15 cards per DSLTNT chassis (Up to 90 ports)
  - Frame Relay and PPP
  - Authentication
  - Speeds (downstream/upstream)
    - 7.0 Mbps/1.0 Mbps, single pair, up to 10,000 feet
    - 2.56 Mbps/1.0 Mbps, single pair, up to 12,000 feet
    - 640 Kbps/544 Kbps, single pair, up to 17,000 feet
  - Lifeline POTS with Splitters
  - List Price: \$4,995



# Product Overview

## Central Office Equipment

- **SDSL**
  - DSLTNT, MAX TNT
  - 16-port per line card
  - Up to 15 cards per DSLTNT chassis (Up to 240 ports)
  - Frame Relay, PPP, MP, MP+
  - Authentication
  - Speeds
    - 1.54 Mbps, two pairs, up to 12,000 feet
    - 768 Kbps, single pair, up to 12,000 feet
  - List Price: \$8,500



# Product Overview

## Central Office Equipment

- **IDSL**
  - DSLTNT, MAX TNT
  - 32-port per line card (dual slot)
  - Up to 7 cards per DSLTNT chassis (Up to 224 ports)
  - Frame Relay, PPP MP, MP+
  - Transparent to Digital Loop Carriers (DLCs) and “U” loop repeaters
  - Authentication
  - Speeds
    - 128 Kbps, single pair, 18,000 feet
  - Up to two Voice channels per IDSL circuit (Q4 1997)
  - List Price: \$8,900



# Product Overview

## Central Office Equipment

- **IDSL**
  - MAX 4000/4002/4004
  - 8-port per line card
  - Up to 5 cards per DSLTNT chassis (Up to 40 ports)
  - Frame Relay, PPP MP, MP+
  - Transparent to Digital Loop Carriers (DLCs) and “U” loop repeaters
  - Authentication
  - Speeds
    - 128 Kbps, single pair, 18,000 feet
  - Up to two Voice channels per IDSL circuit
  - List Price: \$3,000



# Product Overview

## Customer Premises Equipment

- **RADSL-CAP**
  - DSLPipe-C
    - One RADSL-CAP port, one Ethernet port and one console port
    - Frame Relay, PPP
    - Speeds (downstream/upstream)
      - 7.0 Mbps/1.0 Mbps, single pair, up to 10,000 feet
      - 2.56 Mbps/1.0 Mbps, single pair, up to 12,000 feet
      - 640 Kbps/544 Kbps, single pair, up to 17,000 feet
    - Optional Secure Access Firewall
    - List Price: \$1,295



# Product Overview

## Customer Premises Equipment

- **SDSL**
  - DSLPipe-2S
    - Two SDSL ports, one Ethernet port and one console port
    - Frame Relay, PPP, MP, MP+
    - 1.54 Mbps (two pairs), 768 Kbps (single pair)
    - Optional Secure Access Firewall
    - List Price: \$1,650
  - DSLPipe-S
    - One SDSL port, one Ethernet port and one console port
    - Frame Relay, PPP, MP, MP+
    - 768 Kbps (single pair)
    - Optional Secure Access Firewall
    - List Price: \$1,150



# Product Overview

## Customer Premises Equipment

- **IDSL**
  - Pipeline Products
  - One IDSL port, one Ethernet port and one console port (depends on model)
  - Frame Relay, PPP, MP, MP+
  - 2 voice channels (Pipeline 75/85)
  - Optional Secure Access Firewall
  - List Price: Depends on the model



# Product Overview

- **Leverages advanced software functionality**
  - Bridging/Routing support for IP and IPX
  - Frame Relay PVC concentration
  - Ascend Secure Access™ Firewall
  - Authentication security such as Ascend Access Control, RADIUS, TACACS+, TACACS and Token cards
  - Accounting and billing features
  - Virtual Private Network Features
    - Frame Relay and IP Direct
    - Point-to-Point Tunneling Protocol (PPTP) and L2TP
    - Ascend Tunnel Management Protocol (ATMP)
- **Network management system**
  - Ascend network management system
  - Comprehensive SNMP MIB II implementation



# Application

## Intra-Building

- **Businesses in high rise buildings**
- **Residences in apartment complexes**



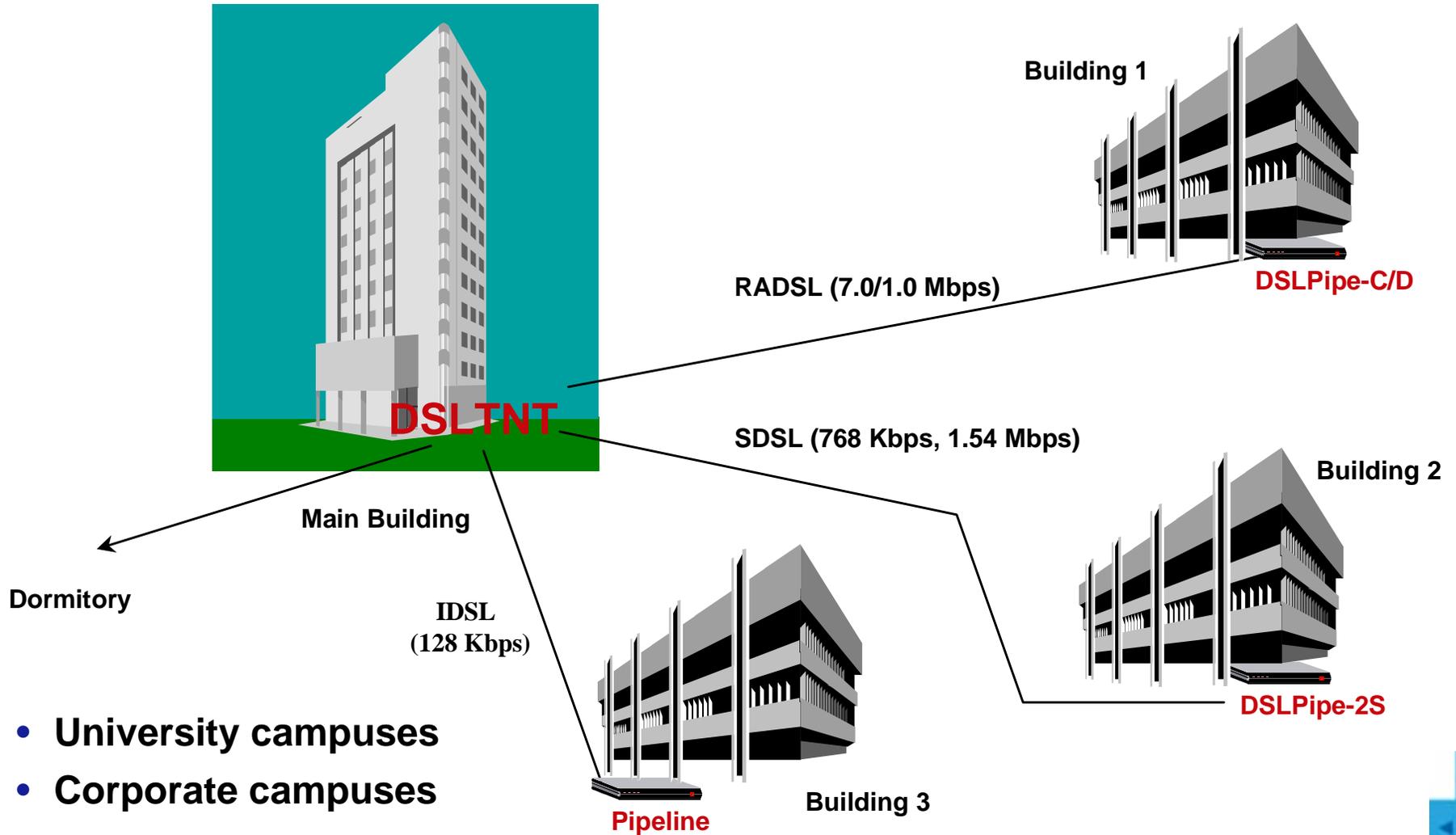
Internet/  
Frame Relay

T1/Frame Relay 1.54 Mbps





# Application Campus



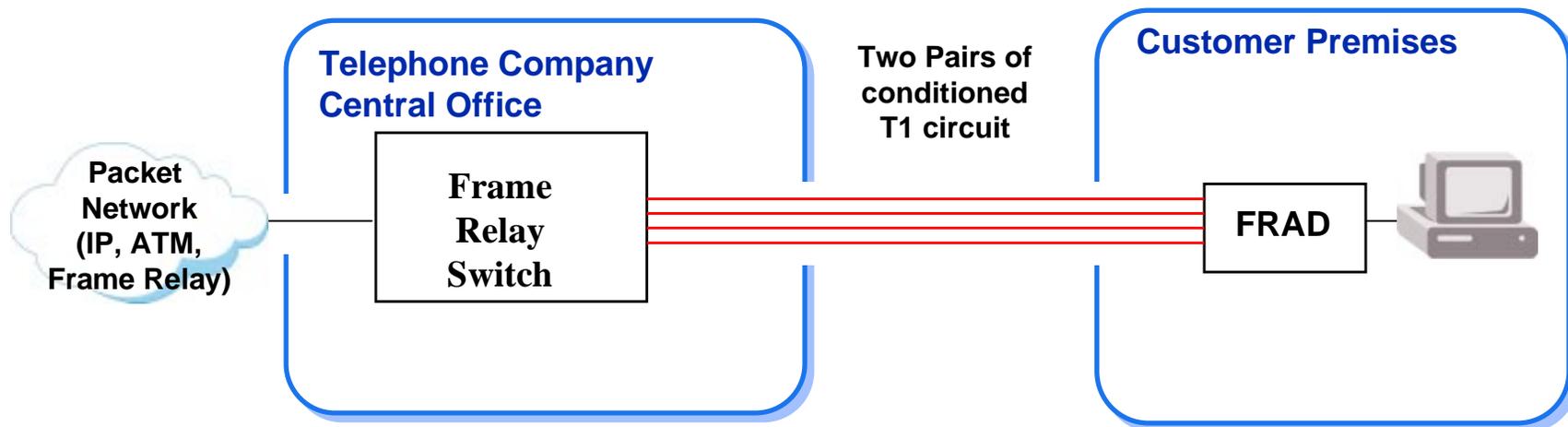
- University campuses
- Corporate campuses



# Application

## Frame Relay Services without MultiDSL

- Requires the most scarce resource: 4-wires
- Requires expensive conditioned T1 circuit
- Expensive circuit cost : Approx. \$290/Month to service providers

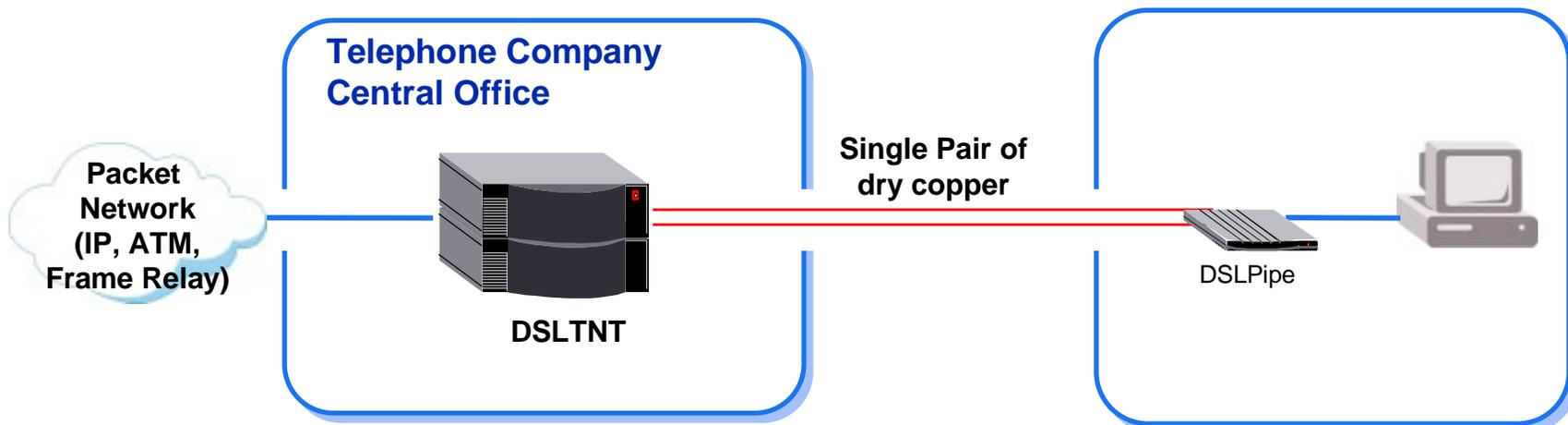




# Application

## Frame Relay Services with MultiDSL

- Single pair of dry copper; saves scarce resource - local loop
- Does not require expensive conditioning
- Lower circuit cost : Approx. \$12/Month to service providers
- High speed : 56K, 64K, 112K, 128K, 768K, 1.0 M, 2.5M, 7.0 M





# Summary

- **Fully integrated, single multi-service platform DSLTNT ready to offer various services**
  - DSL services: IDSL, SDSL, RADSL-CAP, RADSL-DMT
  - Supports other traditional services
- **Seamlessly fits into existing authentication, billing and accounting infrastructure**
- **Routing/bridging capability**
- **Both COE and CPE for turn-key solution**
- **Router based DSLPipe (CPE) for data privacy**
- **Wide range of Egress : T1, Frame Relay, 100Base-T, 10Base-T, DS-3, SWAN, HSSI (1997), ATM (1998)**
- **Highest port density per 7-foot rack in the industry**
- **Protects end users' investment on ISDN CPE**